

RESEARCH ARTICLE

(Open Access)**Heavy metal accumulation in liver tissue of two fish species of Adriatic sea**

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* Author of correspondence email: enkeledaozuni@hotmail.com**Abstract**

The concentration levels of mercury, lead, cadmium and chrome were measured in liver tissue of two valuable fish species of Adriatic Sea, *Lophius piscatorius* and *Trachurus trachurus*. The level of heavy metals was measured by using atomic absorption spectrophotometer (AAS). Concentration levels of heavy metals in liver tissue of both fish species ranged as follows: Hg 0.05 – 1.45; Cd 0.030 – 0.98; Cr nd – 0.131mg/kg wet weight; Pb resulted always below the detection level (nd) in both liver tissue of fish species. As expected, the levels of heavy metal in liver varied significantly between fish species. The results of our study sustain the fact that liver tissue is an important target location of heavy metals accumulation. Based on these findings, *Lophius piscatorius* and *Trachurus trachurus* should be object of further investigation with the final goal to safeguard the population who constantly consume them.

Keywords: heavy metals, *Lophius piscatorius*, *Trachurus trachurus*

1. Introduction

Marine ecosystems are being contaminated persistently by heavy metals due to the impact of both human and nature activities. These fact have affected and threatened aquatic organisms life for decades. Heavy metals have the ability to accumulate and bioaccumulate in such organisms over the time. Many studies have been conducted recently to detect and evaluate the concentration level of heavy metals in different tissues of fish species with commercially importance [2,3,5,6,7,8,10,11,12,13,15]. Most of these studies were focused mainly in muscle tissue of fish as the edible part of it. But beside these literature have showed that the main important target location of accumulation of heavy metals is liver [4,15]. Liver is the main key organ of metabolisms of lipids, carbohydrates, and proteins. Its function is not limited only on this but its further involved in the detoxification process. Referred to importance of liver as an important biological indicator of heavy metals accumulation the object of our study was to evaluate and monitor the concentration level of mercury, lead, cadmium and chrome in liver of two valuable fish

species of Adriatic Sea, *Lophius piscatorius* (Angler fish) and *Trachurus trachurus* (Horse mackerel).

2. Materials and Methods*2.1 Fish sampling*

Fish samples namely *Lophius piscatorius* and *Trachurus trachurus* (origin Adriatic Sea) were collected randomly during (2010 - 2012). According to the weight the fish samples were divided in two main groups: small fish size (mean weight of 140 g) and large fish size (mean weight 2 kg). The fish samples before they were sent to the laboratory of Toxicology, Institute of Veterinary and Food Safety, Tirana they were first, weighed, catalogued and conserved at - 18 C. The study included a total of 40 samples of liver tissue, 20 for each fish species and size.

2.2. Determination of heavy metals

A total of 40 samples of liver tissue of *Lophius piscatorius* and *Trachurus trachurus* were evaluated for the concentration level of mercury, lead, cadmium and chrome by using an Atomic Absorption Spectrophotometer (AAS). The liver sample tissue of

the fish species was homogenized in a blender; they were dried at 100 °C. One g of sample was weighed and then treated with 10 ml of HNO₃ and 5 ml of concentrated H₂SO₄ and let in overnight. The next day they were dried at 150° C for at least, 30 minutes and 50 ml of it were put into a normal flask, and filled with tap water. The heavy metals were measured by ICP-OES, Optima 2100 Dv produced by Perkin Elmer. Heavy metal concentration in fish liver was expressed in mg/kg wet weight (mg/kg ww).

2.3. Statistical analysis

The comparison of the data between two groups was held by using student test, possibilities less than 0.05 was considered statistically important (p<0.05). The entire statistic evaluation was carried out by using SPSS 20.0 (Statistical Package for Social Science). (The statistical data on the below table 1 and 2 comprised average, standard deviation, standard error, p value and interval of confidence).

3. Results and Discussion

Concentrations of heavy metals (Hg, Pb, Cd and Cr) in liver tissue of fish species Horse mackerel and Angler fish (*L.piscatorius*) and *T.trachurus*) are

Table 1. Average mean value concentration of heavy metals in the liver of *Lophius piscatorius* with different weight (small & large fish size) (mg/kg ww)

<i>Species Lophius piscatorius, liver tissue</i>								
Metals	weight	Nr	A	SD	SE	t	df	P
Hg	small	10	.0598	.0118	.0037	-9.7276	18	<0.001
	large	10	1.4503	.4519	.1429			
Cd	small	10	.0307	.0138	.0044	-8.6518	18	<0.001
	large	10	.9810	.3471	.1098			
Pb	small	10	.00					
	large	10	.00					
Cr	small	10	.1318	.1390	.0440	2.2972	18	0.034
	large	10	.0289	.0271	.0086			

Heavy metals in *Trachurus trachurus*: From the comparison of the data resulted that exists an important statistical change according to mean value accumulation of Cd (p<0.001) in liver tissue of *T. trachurus* in both fish size (small & large fish size).

given in table 1 and 2 respectively. From the comparison of the data resulted that the mean concentration level of Hg, Cd and Cr varied widely not only among fish species but also between fish size. The order of heavy metal accumulation in both groups of fish species samples followed these range: Hg>Cd>Cr.

Heavy metals in *Lophius piscatorius*: From the comparison data of the study (Tab. 1) resulted that exist an important statistical change according to mean value accumulation of Hg (p<0.001), Cd (p<0.001) and Cr (p=0.034) in liver tissue samples of *L.piscatorius* with different size. The highest concentration value of Hg (mg/kg ww) resulted in large fish size (0.451±0.142) compare to small fish size (0.059±0.011). The same results was obtained in case of Cd in which large fish size (0.981±0.347) revealed higher concentration level of accumulation versus small fish sized (0.030±0.013) of *L.piscatorius*. About Cr (mg/kg ww) the highest concentration level resulted in large fish size (0.131±0.13), in stand of small fish size (0.028±0.027). Based in table 1 lead resulted always below the detection levels (nd) in all liver fish samples.

The highest concentration level of Cd (mg/kg ww) resulted in large fish size (0.067±0.009), compare to small fish size (0.0362±0.011). According to Hg (p=0.08) the data of the study doesn't showed any relevant statistical change in both fish size of this fish

species. Based on table 2 lead and chrome resulted always below the detection level (nd) in all liver fish samples of *T.trachurus*.

Table 2. Average mean value concentration of heavy metals in the liver tissue of *Trachurus trachurus* with different weight (small & large fish size) (mg/kg ww)

<i>Species Trachurus trachurus, liver tissue</i>								
Metals	weight	Nr	A	SD	SE	T	df	P
Hg	small	10	.0828	.0074	.0023	-1.8549	18	.080
	large	10	.1062	.0392	.0124			
Cd	small	10	.0363	.0117	.0037	-6.6112	18	<0.001
	large	10	.0677	.0094	.0030			
Pb	small	10	.00					
	large	10	.00					
Cr	small	10	.00					
	large	10	.00					

The entire data of the study shows that liver tissue of both fish species is contaminated with Hg, Cd and Cr, except for Pb which resulted in both species below the detection level (nd). Many studies stated that contamination of fish species with heavy metals is closely connected not only to fish species, age, size, sex but also to other factors such as living environment and feeding behavior [1,3,4,14,16]. The highest concentration level of Hg and Cd resulted in liver tissue of *L.piscatorius* instead of *T.trachurus* (Tab.1&2). These fish species both originate from Adriatic Sea, but they differ from each other according to size, habitat and feeding behavior. Fish species as *L. piscatorius* with large dimensions who lives into near contact with the sediment are more exposed to heavy metals pollutants than other fish species [13]. *T.trachurus* is a pelagic fish species, with different ecological need and feeding regime. Based on literature pelagic species revealed low concentration levels of heavy metals than benthic fish species [9], which in fact is in accordance with the data of our study. Furthermore it is clear by the study the fact that liver tissue is contaminated by cadmium, mercury and chrome. Organs as liver have the ability to bioaccumulate, biotransform and excrete pollutants as heavy metals. These is the main reason why liver tissue is used as an important indicator of heavy metals pollution in commercially fish species as in fact *L.piscatorius* and *T.trachurus* are for Albanian

consumers. Based on consumers preferences liver as internal organ of fish is excluded for food consumption. But Albanians fishery consumers made an exception in which liver of *L.piscatorius* is used for human consumption. These is one of the reason why these commercially fish species and not only should be object of further investigation of heavy metal pollution.

4. Conclusions

The result of the study sustain the fact that liver tissue of *L.piscatorius* and *T.trachurus* are contaminated with dangerous heavy metals such as mercury and cadmium. The contamination of liver tissue of both fish species may serve not only an important indicator of metal pollution of Adriatic Sea but also to commercially fish species who lives on it and are used as food by Albanians consumers.

5. References

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